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water lakes, extending from Galilee to the Nyanza, Nyassa, and Zambesi, when an ichthyological fauna was developed suited to the warm conditions that prevailed, part of which survives in the Jordan.

During the glacial period the temperature of Lebanon must have been similar to the present Alps, as the existing mammals and birds on the summits are identical with those of the Pyrenees and the Alps; not so the glacial flora, of which almost every trace has been lost. But the flora had not the same powers of vertical migration with the fauna, of which, however, the Elk, Red Deer, and Reindeer, found in the bone-caverns, have long since perished.

During the present period the Mediterranean forms have overspread the whole country, excepting the mountain-tops at an elevation of 9000 feet, and the Jordan depression. These two exceptions can be best explained by the fact that the traces of the glacial inroad are not yet wholly obliterated, and that the preceding warm period has left its yet stronger mark in the unique tropical "outlier" of the Dead-Sea basin, analogous to the boreal outliers of our mountain-tops, the concave depression in the one being the complement of the convex elevation in the other.

- II. "New Researches on the Dispersion of the Optic Axes in Harmotome and Wöhlerite, proving these Minerals to belong to the Clinorhombic (Oblique) System." By M. A. L. O. DES CLOISEAUX. Communicated by Prof. W. H. MILLER, For. Sec. R.S. Received March 12, 1868.

(Abstract.)

We are already acquainted with a considerable number of crystals, natural as well as artificial, the forms of which have only been determined with precision by the examination of their optical properties as doubly refracting bodies. Harmotome and Wöhlerite furnish two fresh examples of this; and they afford all the more important proof of the necessity of appealing to these properties, inasmuch as the crystals of these substances would appear certainly to be derived from a right rhombic prism, so long as we consider only the apparent symmetry of their external forms, or the orientation of the plane containing their optic axes. The different sorts of dispersion which these axes might be capable of presenting are so feeble, and so difficult of appreciation on account of the slight transparency of Wöhlerite, and the complex structure of the crystals of Harmotome, that the determination of these dispersions has hitherto been too incomplete to allow of any conclusion being drawn as to the crystalline type they might otherwise serve to characterize.

It was a remark of M. Axel Gadolin that induced the author to resume the attentive study of the phenomena of dispersion, first in Harmotome, and then in Wöhlerite, and as a consequence to modify the crystallographic type to which these minerals have been in general referred.

Harmotome.

Several years ago the author showed that simple crystals of Harmotome did not exist, and that those of Strontian in Scotland (Morvenite), considered as such, prevented, in fact, a twinning formed by the interpenetration of two principal individuals. The particular orientation of the plane of the optic axes in each of the crystals of which the least complicated of such groups are composed had led him to refer their crystalline form to a right rhombic prism of $124^{\circ} 47'$; and he had been induced to look on this prism as presenting a peculiar sort of hemihedrism, or rather hemimorphism, such that only one-half of the fundamental rhombic octahedron existed, that namely formed of four faces parallel two and two, and lying in the same zone. More recently, in studying the modifications which heat induces in the position of the optic axes and of their plane, he observed a phenomenon less compatible with the hypothesis of a primitive rhombic form; but the slight transparency of the plates on which he operated, the wide separation of the optic axes, which rendered the examination of the two systems of rings almost impossible in air, and finally the almost complete absence of dispersion, led him to regard the observed result as an apparent anomaly, attributable to the highly complex structure of the crystals.

Desirous of verifying the truth of a suggestion communicated to him by M. Gadolin in June 1867, the author had some new plates cut normal to the acute, *positive* bisectrix from very transparent crystals of the Scotch Morvenite, and he has been able to establish the existence of a very decided twisted dispersion. In consequence of the smaller mutual inclination of the optic axes in these than in the former plates, the author was also able to satisfy himself directly that the displacement impressed by heat on the plane containing these axes is a rotary one, quite analogous to that which he had shown to exist in borax and Heulandite. It is therefore now beyond doubt that the crystalline type of Harmotome is the oblique rhombic prism, and the author has corrected the crystallographic description of the mineral accordingly.

Wöhlerite.

In his 'Manual of Mineralogy,' the author had described the crystals of Wöhlerite as derivable from a prism of very nearly 90° . From the point of view from which a consideration of the orientation of their optic axes had induced him to regard them, they appeared to offer a certain number of homohedral forms associated with forms that were hemihedral or hemimorphic, analogous to those that he had drawn attention to in Harmotome. Having proved that the latter mineral belongs to the clinorhombic system, he endeavoured to ascertain whether this was not also the case with Wöhlerite, all the forms of which would in that event be homohedral. But in this case a study of the different varieties of dispersion is rendered difficult by the yellow colour, and by the imperfect transparency

presented by the substance even when in very thin plates. Besides this, contrary to what is found in Harmotome, while the dispersion belonging to the optic axes is very distinct, the *horizontal and twisted* dispersions, which should be sought for in plates normal to the two bisectrices, are, on the contrary, but slightly evident. However, on examining in oil some thin plates placed so as to have the plane of their optic axes horizontal and perpendicular to the plane of polarization, the author observed in the plates normal to the obtuse, *positive* bisectrix, some faint blue and red fringes, dispersed in contrary directions above and below the bars which traverse the two systems of rings, indicating the existence of an appreciable *twisted* dispersion. In the plates normal to the acute, *negative* bisectrix, the transverse bar of each system is bordered on one side by a very pale blue, and on the opposite side by an equally pale yellow, the horizontal dispersion being thus feebly indicated.

The crystals of Wöhlerite ought, then, to be referred to an oblique rhombic prism, in which the plane of symmetry is normal to the plane which contains their optic axes. The primitive form which it seems most convenient to choose is a prism with an angle of very nearly 90° , which presents a cleavage, easy though interrupted, parallel to its plane of symmetry, and cleavages which are more difficult in the directions of the lateral faces *m* and of the plane *h'* which is parallel to the horizontal diagonals of the base.

The author then describes in detail the crystalline form of Wöhlerite as thus corrected.

III. "On the Law of the Resistance of the Air to Rifled Projectiles." By CHARLES W. MERRIFIELD, F.R.S., Principal of the Royal School of Naval Architecture. Received March 19, 1868.

(Abstract.)

At the beginning of this month Lieut.-Col. H. R. Halford applied to the author to obtain for him the law of atmospheric resistance resulting from his experiments in shooting with Metford's match-rifle, a small bore with increasing pitch. Col. Halford had determined by experiment the elevations required for the ranges 100, 200, &c. up to 1100 yards, each determination being derived from a very large number of shots; and the table of experimental elevations, corresponding to these various ranges, formed the datum furnished to the author.

As all the trajectories were very low, the greatest elevation amounting to only $2^\circ 35' 30''$, the author assumed, as a sufficiently close approximation, that the vertical motion was determined solely by the force of gravity, and that the effect of the resistance of the air on the velocity was the same as if the projectile had moved strictly in a horizontal line. Consequently the depression of the point in which the target is struck, below the initial